User Guide to Selected AIRS Radiance QA Swath Data Fields

"**CalChanSummary**" identifies calibration performance for each channel over the whole granule. It follows a format similar to **CalFlag** and **CalScanSummary**, but uses the granule-level QA indicators as inputs. The bit structure definition is provided in Table 1.

Bit	Name	How Set (Per granule)
7	Scene	overflow/underflow on scene occurred
6	Offset	overflow/underflow on SV occurred
5	Gain	overflow/underflow on OBC BB view occurred, or the signals or temperatures were out of limits
4	pop detected	The difference between 6 corresponding calibration footprints exceed the threshold
3	Noise out of bounds	NEN Exceeds Limits for granule
2	spectral bad	Spectral fit failed or fit residuals too high
1	Telemetry	Out of limit condition occurred in a key telemetry item
0	Reserved	

Table 1. Definition of bit structure for the CalChanSummary Word. The CalChanSummary is provided for every channel once per granule.

"CalGranSummary" is a bitwise summary of the performance of the granule for a subset of channels. This flag is a logical "OR" of the CalChanSummary word applied over all channels with ExcludedChans < 3.

"**ExcludedChans**" is defined as the ABstate for each channel from the Channel Properties file used by the Level 1B PGE. The ABstate is a number from 0 through 6 that describes the quality of the channel and whether the A side or the B side detectors are used. Channels with an ABstate of 0, 3, or 6 use both the A side and the B side, channels with an ABstate of 1 or 4 use the A side only, and channels with an ABstate of 2 or 5 use the B side only. In general, channels with ABstate < 3 are less noisy and have fewer pops than channels with ABstate ≥ 3, and channels with an ABstate of 6 are not responsive.

"**Rdiff_swindow**," "**Rdiff_lwindow**," and "**Rdiff_strat**" are radiance differences in three regions where the AIRS spectrometer includes duplicate spectral coverage. These pairs of "overlap channels" are listed in Table 2. The pairs were chosen for their good NEDT, their reasonable SRF centroid overlay, their good spectral and radiometric calibration, and for their FOV centroid shift relative to the focal plane average centroid.

QA Indicator Name	PGE Chan	SRF Centroid (cm^{-1})
Rdiff_lwindow_M9_chan	**597**	**847.837**
Rdiff_lwindow_M8a_chan	**625**	**856.342**
Rdiff_swindow_M1a_chan	**2280**	**2560.853**
Rdiff_swindow_M2a_chan	**2252**	**2560.460**
Rdiff_strat_M1b_chan	**2027**	**2310.456**
Rdiff_strat_M2b_chan	**2000**	**2310.524**

Table 2. Identification of the "Rdiff" channel selection for L1B processing

These 6 PGE channel definitions are placed in the L1B QA data file for every granule. Additionally, the calculated radiances, N, are differenced as follows and the results placed in the L1B data file. The radiance differences are also provided for every footprint.

$$\text{Rdiff\_lwindow} = \text{N(Rdiff\_lwindow\_M8\_chan)} - \text{N(Rdiff\_lwindow\_M9\_chan)} + \text{water\_offset}$$

$$\text{Rdiff\_swindow} = \text{N(Rdiff\_swindow\_M1a\_chan)} - \text{N(Rdiff\_swindow\_M2a\_chan)} + \text{window\_offset}$$

$$\text{Rdiff\_strat} = \text{N(Rdiff\_strat\_M1b\_chan)} - \text{N(Rdiff\_strat\_M2b\_chan)} + \text{CO2\_offset}$$

where **water_offset, window_offset**, and **CO2_offset** are defined in the I1b_params.txt file used by the PGE. They are set to be zero in this release.

"**SceneInhomogeneous**" is defined based on the radiance differences defined above. Each of the differences are checked to see if they are greater than some factor, N_Rdiff_*, times the RSS of the noise level of each of the channels. If they are, then the corresponding bit in the **SceneInhomogeneous** word is to be set to high. The algorithm is as follows:
If

$$|\text{Rdiff\_lwindow}| \geq \text{N\_Rdiff\_lwindow} \times \sqrt{\text{NEN(Rdiff\_lwindow\_M8\_chan)}^2 + \text{NEN(Rdiff\_lwindow\_m9\_chan)}^2}$$

then SceneInhomogenous(bit=6) = 1. Initially after launch, **N_Rdiff_lwindow** will be set to 5 however this may change after Launch..

Similarly for **Rdiff_swindow** and **Rdiff_strat** for bits 7 and 5 of SceneInhomogenous respectively.